

PART NINE

ART WORK

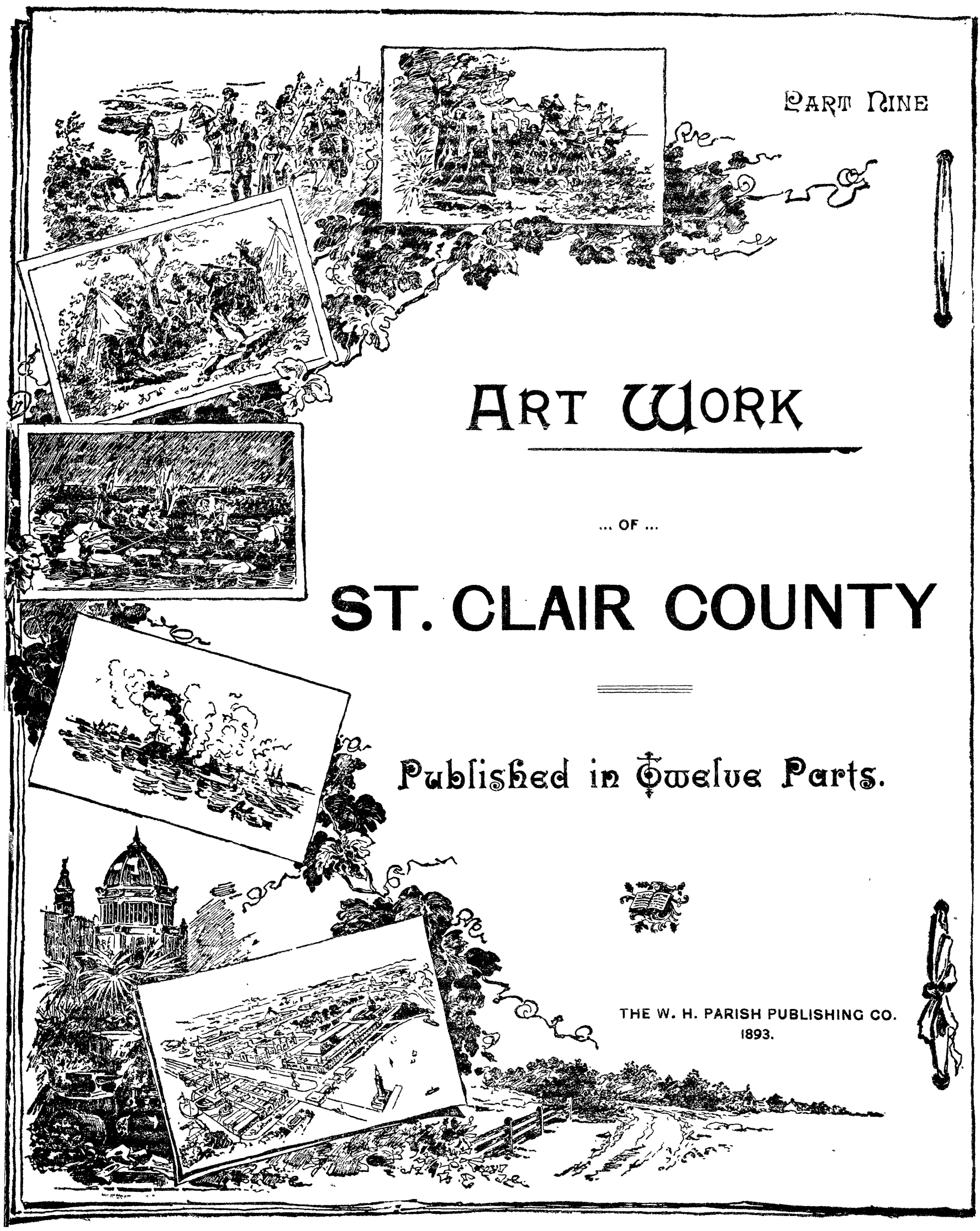
... OF ...

ST. CLAIR COUNTY

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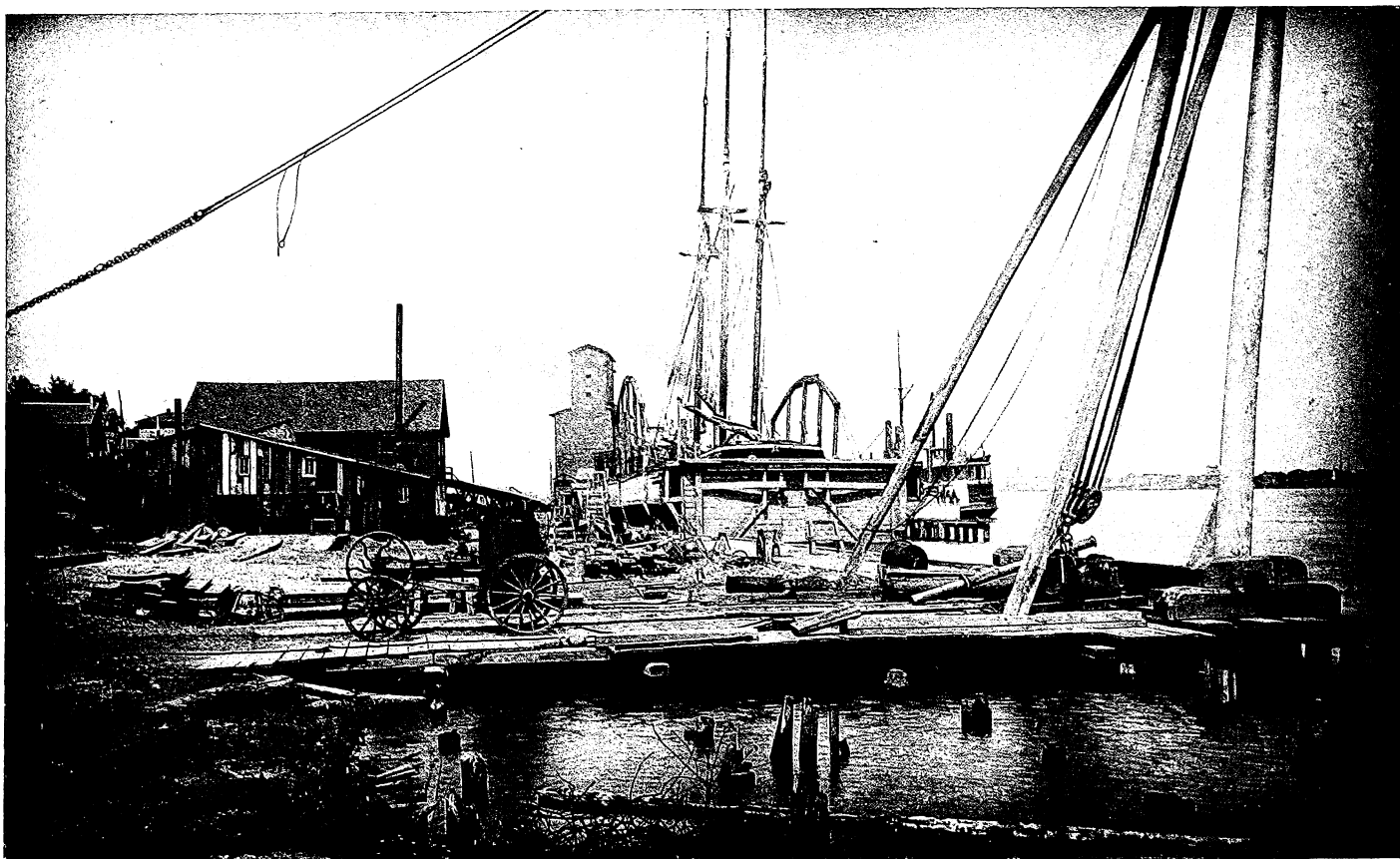




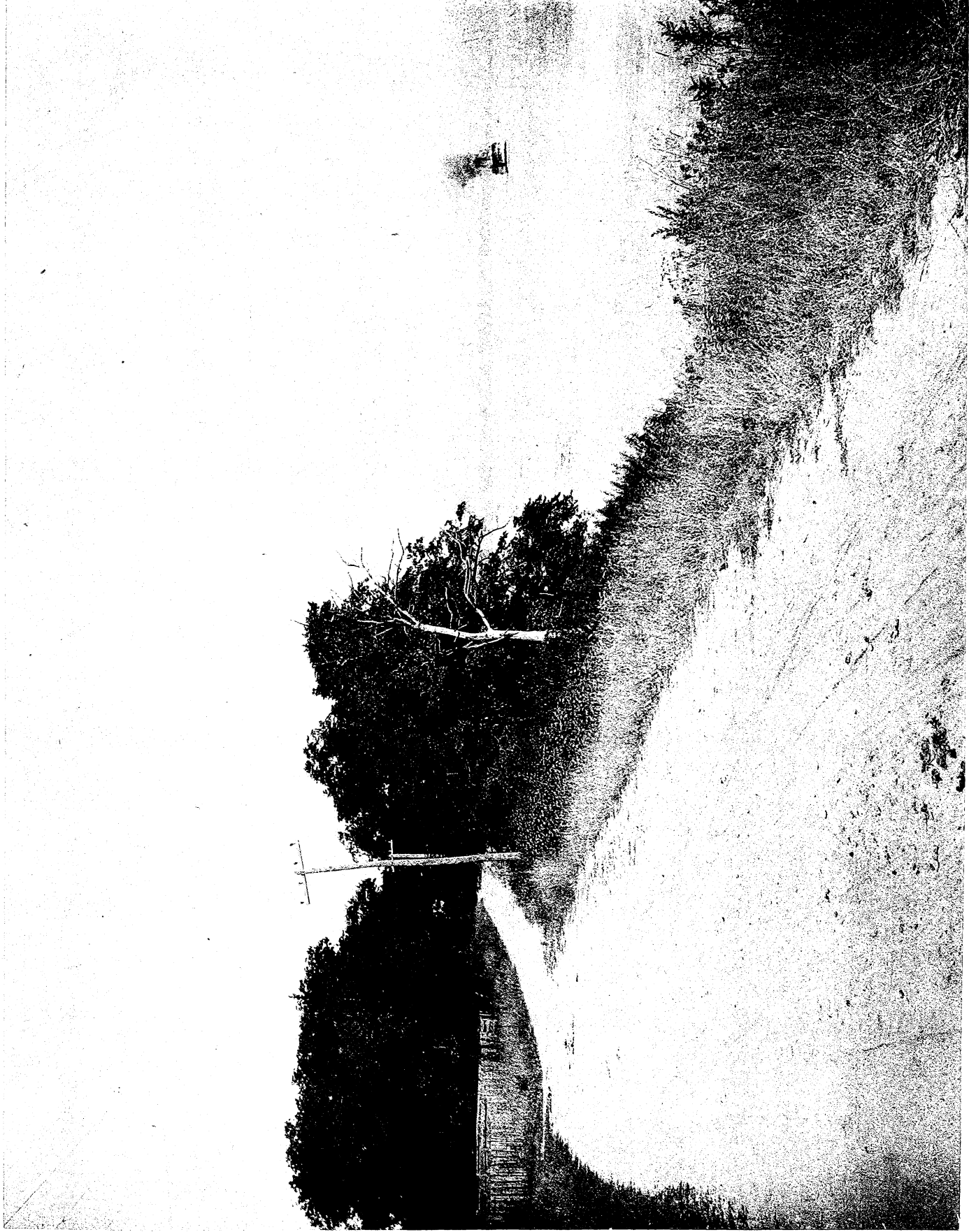
VIEW ON WATER STREET, FROM MILITARY STREET—PORT HURON.



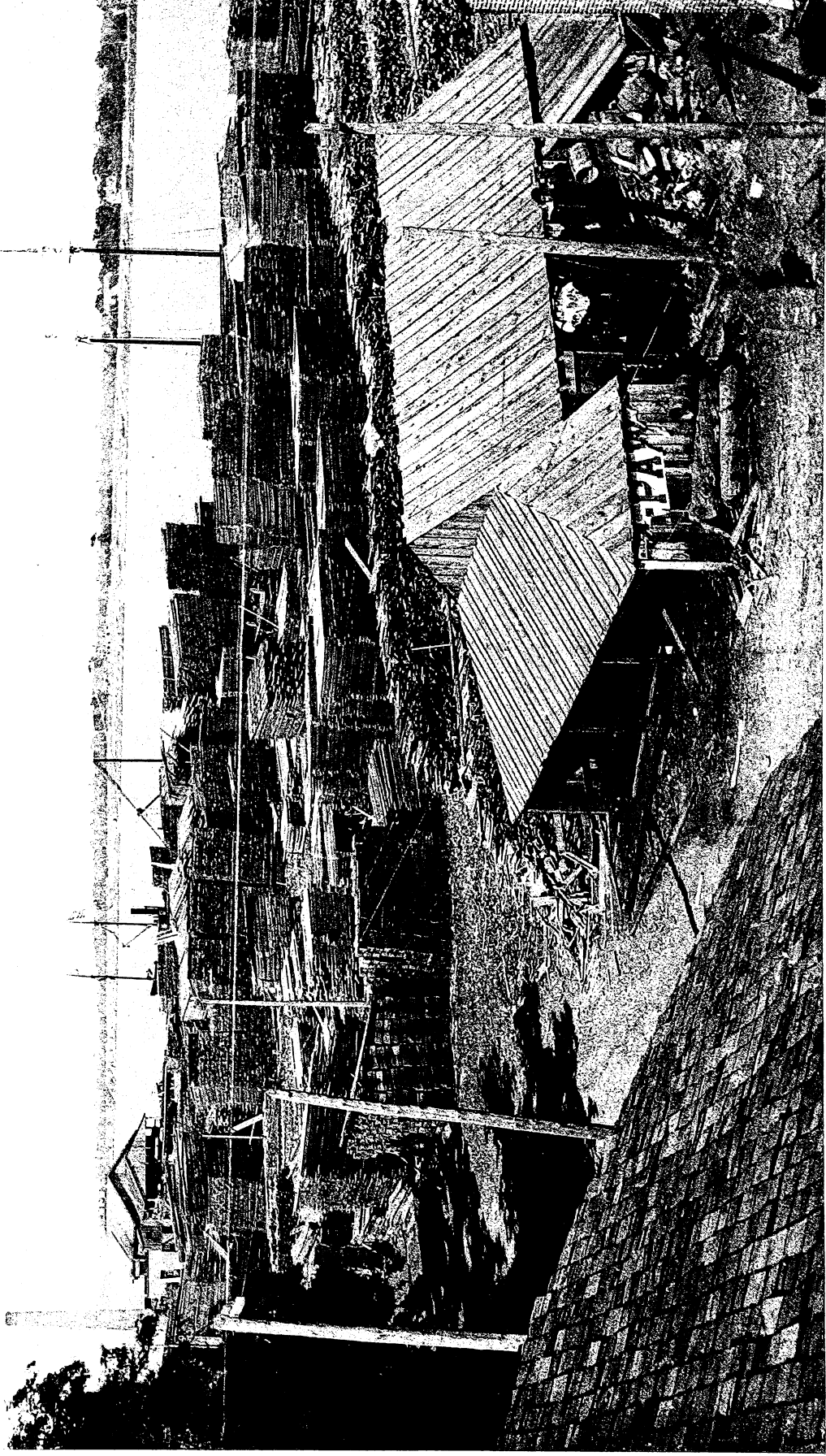
STREET CAR OFFICE AND BARN—PORT HURON.



THE WOLVERINE DRY DOCKS—PORT HURON.



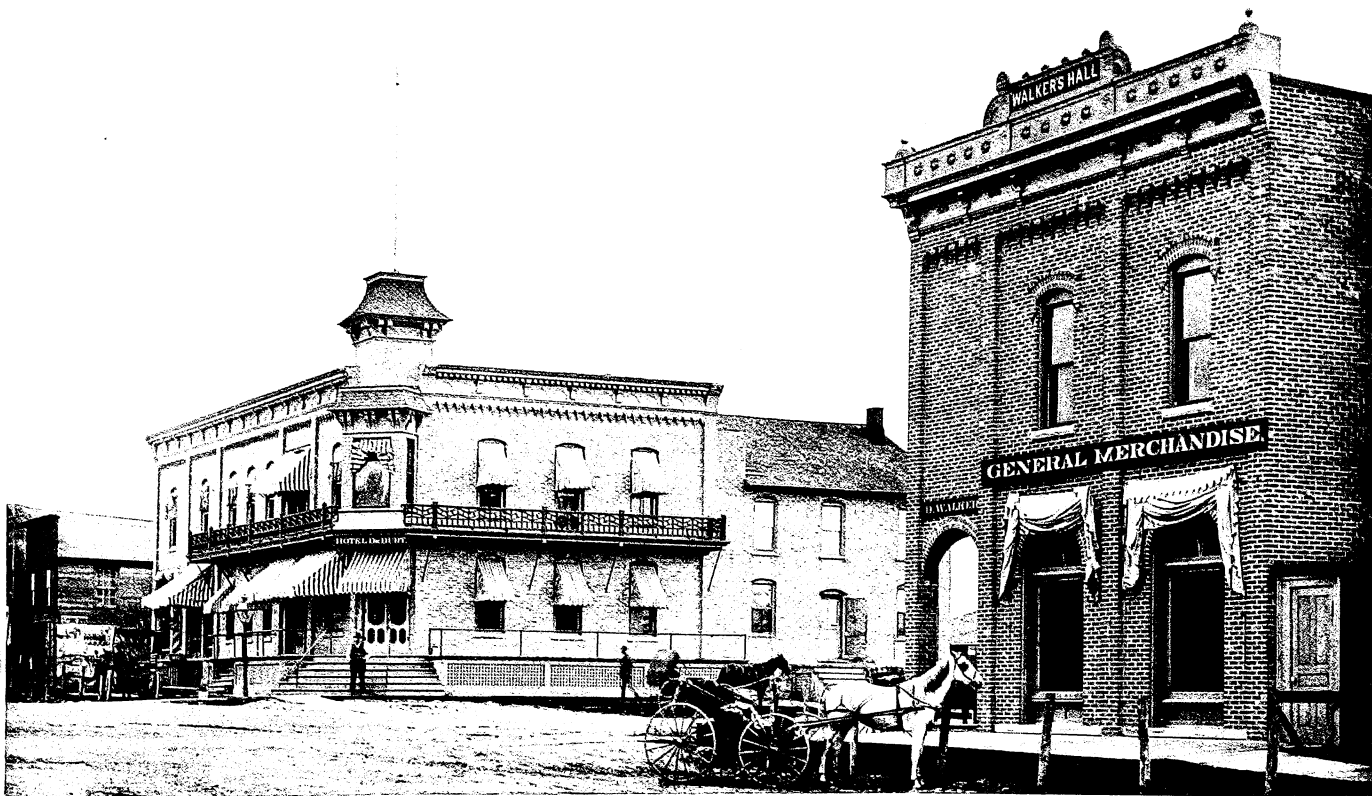
SCENE BETWEEN ST. CLAIR AND MARINE CITY.



VIEW OF LUMBERING INTEREST OF N. & B. MILLS—MARYSVILLE.



SCENE ON WATER STREET—ALGONAC.



SCENE ON MAIN STREET—CAPAC.



THE WINDERMERE HOTEL AT GRATIOT BEACH—PORT HURON.

curbing which is put together inside the shield. The length of the shield is twenty-one feet six inches, and the plates of which it is built are one inch in thickness. After starting an average, progress of sixteen feet per day was made until the shields met under the bed of the river. The distance traversed by these massive cylinders of steel was 6,000 feet, being the distance from portal to portal of the tunnel. When at work the iron lining or tubing is put together inside of the shield, or in that portion of it usually called the hood. The hydraulic jacks are then made to press against the completed lining, by which means the shield is pushed forward into the clay a sufficient distance to admit of another ring or set of completed segments. By this forward movement of the shields a space sufficient to admit of another section of a completed lining is made, and, the space being filled, the process is repeated again and again as the work progresses. As the shield is pressed forward into the clay workmen with peculiarly shaped hollow or curved spades are in readiness to remove the clay through the apertures in the shield to the cars in waiting. These cars are drawn by mules, and they in turn convey the clay entirely outside of the tunnel. The extreme end of the completed tunnel lining is always within and always protected by the shield, and thus the clay is safely excavated.

“SURFACE DEPRESSION.

“The settling or depression of the earth on the surface does not occur until the completed segments of curbing are placed in position. In the course of a few hours, however, after the shield has passed, there is invariably noticed on the surface of the earth, on the line with the tunnel, a depression ranging from ten to twenty inches. In one instance, on the Michigan side, the tunnel passed under a brick dwelling, and the sinking or depression of the earth caused by the excavation rendered this structure useless, notwithstanding the depth of earth under this house to the top of the tunnel exceeded seventy feet. Of course it is presumed the earth also sinks under the river on a line with the tunnel, although I cannot say that this fact has been demonstrated.

“CHARACTER OF SOIL EXCAVATED.

“The material through which the shields were made to pass from portal to portal is principally soft blue clay, interspersed with pockets of gravel, coarse sand and quicksand. Boulders are sometimes encountered, but they are usually small; occasionally, however, they are so large as to require to be broken in order to facilitate their passage through the compartment

apertures of the shield. To accomplish this a resort is had to the drill and the wedge; by this means they are soon reduced and carried to the rear. Under the river bed the clay was found to be much softer and more easily excavated than in the approaches from either side.

“AIR LOCKS.

“When the tunnel had progressed from the portals each way to the respective banks of the river air locks or diaphragms of solid masonry were constructed. These were placed at the banks of the river, on a line with the water's edge, and built in such a manner as to withstand a very heavy air pressure. These bulkheads of brick and iron are supplied with massive iron doors, sufficiently large to admit a car of clay from the inner chamber of the tunnel, and arranged in such a manner as to form an air lock. Persons proceeding into that portion of the tunnel which underlies the river must necessarily pass through the air locks. You pass through the first door of the lock into a compartment, and the door is then closed. Into this compartment the compressed air of the inner tunnel is then slowly or gradually admitted. When it becomes equalized with the compressed air of the tunnel proper, the rear door of the diaphragm is opened and the person may pass into that portion of the tunnel which is still pervaded by compressed air. In passing out from the heavy air pressure the pressure in the lock compartment is gradually reduced until it is equalized with the normal pressure in the open tunnel. Thus the process by which persons are admitted to the inner tunnel is reversed when it becomes necessary to pass them out. The compressed air is introduced into the inner tunnel by means of four class A Ingersoll-Sargeant air compressers.

“EFFECTS OF COMPRESSED AIR ON THE ANIMAL SYSTEM.

“Some difficulty was experienced at the outset on account of the disinclination of men to subject themselves to an extra air pressure made necessary in order to secure the safety of the work; but, as a rule, no inconvenience resulted from its use. Especially is this true of the American end of the tunnel, where the pressure during the progress of the tunnel until the meeting of the shields did not exceed seventeen pounds to the square inch. On the Canadian side large pockets of quicksand and gravel were encountered, and as a consequence a much greater pressure was required to keep back the water, without which this great work would have fell short of successful achievement. Therefore, for many days, a pressure was kept up which slightly exceeded twenty-eight pounds to the square inch. I am satisfied, from observation, that

